AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Currently Amended): A packet transfer method comprising:

causing a transmission-source access network to generate at least one packet to be transferred to a destination access network, and to transmit said at least one packet to a transmission-source packet transfer apparatus connected to said transmission-source access network;

causing said transmission-source packet transfer apparatus to convert said at least one packet into a superpacket having a length n times (n is an integer of not less than 2) larger than a fixed-length cell, said superpacket serving as a switching unit of relay means arranged on a network, and to send the superpacket to said network;

causing said network to relay the superpacket using said relay means, and to transfer the superpacket to a destination packet transfer apparatus connected to said destination access network; and

causing said destination packet transfer apparatus to reassemble said at least one packet generated by said transmission-source access network on the basis of the superpacket transferred from said network, and to send said at least one packet to said destination access network,

wherein when said at least one packet cannot fit the superpacket, the forming means

places a portion of the packet into the superpacket and another portion of the packet into another

superpacket, and

wherein, when the superpacket is occupied with a single packet or a portion of the single

packet, the forming means sets a single packet occupation field to ON.

2. (Previously Presented): A method according to claim 1, further comprising:

causing said transmission-source packet transfer apparatus to individually store the

transmitted packets by their respective destination transfer apparatuses, forming the superpacket

for each of said destination packet transfer apparatuses, and sending the superpacket to said

network, and

causing said destination packet transfer apparatus to individually store the superpackets

transferred from said network by their respective transmission-source packet transfer apparatuses

and reassembling the packet for each of said transmission-source packet transfer apparatuses.

3. (Previously Presented) A method according to claim 2, further comprising:

causing said transmission-source packet transfer apparatus to detect for each of said

destination packet transfer apparatus that the superpacket is not formed for a first time-out time,

and

if a packet is stored in association with said destination packet transfer apparatus and the

superpacket is not formed for said first time-out time, causing said transmission-source packet

transfer apparatus to form the superpacket from the packet and to send the superpacket to said

network.

4. (Previously Presented) A method according to claim 2, further comprising:

causing said destination packet transfer apparatus to detect for each of said transmission-

source packet transfer apparatus that the packet is not reassembled for a second time-out time,

and

if a superpacket is stored in association with said transmission-source packet transfer

apparatus without reassembly for said second time-out time, causing said destination packet

transfer apparatus to discard the superpacket.

5. (Previously Presented) A method according to claim 1, further comprising:

when the packet transmitted from said transmission-source access network crosses a

plurality of superpackets, said transmission-source packet transfer apparatus divisionally sends

the packet to said network using the plurality of superpackets, and

when the packet is transferred from said network in said plurality of superpackets, said

destination packet transfer apparatus reassembles the transmitted packet by connecting said

plurality of superpackets and then sending the reassembled packet to said destination access

network.

6. (Original) A method according to claim 1, further comprising:

causing said transmission-source packet transfer apparatus to store, as a transmission-source address and destination address in a header of the superpacket, unique network addresses defined only in said network and assigned to said transmission-source packet transfer apparatus and said destination packet transfer apparatus, respectively, and send the superpacket to the network, and

causing each relay means in the network to look up the header of the transferred superpacket to specify a relay destination of the superpacket in accordance with the network address assigned to said destination packet transfer apparatus and transfer the superpacket to said destination packet transfer apparatus.

7. (Currently Amended) A packet transfer apparatus for transferring at least one packet between an access network for transmitting/receiving said at least one packet and a network serving as a backbone having relay means for relaying said at least one packet, comprising:

forming means for converting said at least one packet into a superpacket, the superpacket has a length n times (n is an integer of not less than 2) larger than a fixed-length cell, said superpacket serves as a switching unit of said relay means, and for sending the superpacket to said network; and

reassembler means for extracting said at least one packet from the superpacket sent from said network and sending said at least one packet to said access network,

wherein when said at least one packet cannot fit the superpacket, the forming means

places a portion of the packet into the superpacket and another portion of the packet into another

superpacket, and

wherein, when the superpacket is occupied with a single packet or a portion of the single

packet, the forming means sets a single packet occupation field to ON.

8. (Previously Presented) An apparatus according to claim 7, wherein said forming

means comprises first storage means having queues for storing the packets, wherein the packets

are stored by their respective packet transfer destination apparatus in the queues, and wherein

said forming means detects the number of the stored packets, and when the number of stored

packets is sufficient for forming the superpacket, said forming means extracts the packets from

the queue to form the superpacket.

9. (Previously Presented) An apparatus according to claim 8, wherein said forming

means further comprises:

for each of said queues of said first storage means, first time count means for starting

time counting every time the superpacket is formed and detecting an elapse of a first time-out

time from the time count start time, and

when the elapse of the first time-out time is detected, said forming means forms the

superpacket from the packets stored in the queue.

10. (Original) An apparatus according to claim 9, wherein the first time-out time is determined on the basis of a predetermined minimum band for each traffic on said network.

11. (Original) An apparatus according to claim 9, wherein the first time-out time is determined on the basis of a predetermined allowable network delay time for each traffic on said network.

12. (Previously Presented) An apparatus according to claim 7, wherein said reassembler means comprises second storage means having queues for storing the superpackets, wherein said superpackets are stored by their respective packet transfer source apparatus in the queue, and wherein said reassembler means reassembles the packet from the stored superpacket.

13. (Previously Presented) An apparatus according to claim 12, wherein said reassembler means comprises, for each queue on said second storage means, second time count means for starting to count time every time the packet is reassembled and for detecting an elapse of a second time-out from the time count, and wherein when the elapse of the second time-out time is detected, the reassembler means discards the superpacket from the queue.

14. (Previously Presented) An apparatus according to claim 13, wherein the second time-out is determined on the basis of a predetermined minimum band or maximum allowable

value of at least one of a network delay for each traffic on said network, delay distribution time

in said network, and predetermined protection time.

15. (Original) An apparatus according to claim 7, wherein said forming means detects

that the packet crosses a plurality of superpackets and divisionally stores the packet in the

plurality of superpackets, and said reassembler means detects that the packet on the superpacket

crosses a plurality of superpacket and links packet data divisionally stored in the plurality of

superpackets to reassemble the original packet generated by said transmission-source access

network.

16. (Previously Presented) A packet transfer apparatus for transferring a packet between

an access network for transmitting/receiving the packet and a network serving as a backbone

having relay means for relaying the packet, comprising:

forming means for converting the packet into a superpacket having a length n times (n is

an integer of not less than 2) larger than a fixed-length cell, said superpacket serving as a

switching unit of said relay means, and sending the superpacket to said network; and

reassembler means for extracting the packet from the superpacket sent from said network

and sending the packet to said access network,

wherein:

the superpacket stores single packet occupation information representing whether

a payload of the superpacket is occupied by data of a single packet,

said forming means compares a length of each packet with a length of the payload

of the superpacket and sets the single packet occupation information to occupation ON or

occupation OFF in accordance with a comparison result, and

said reassembler means detects that the single packet occupation information on

the superpacket represents occupation ON and links packet data on a series of

superpackets until an arrival of the superpacket with the single packet occupation

information representing occupation OFF to reassemble the original packet generated by

said transmission-source access network.

17. (Original) An apparatus according to claim 7, wherein a header of the superpacket

has the same format as that of a header of the packet.

18. (Currently Amended) A packet communication system comprising:

an access network for transmitting/receiving a packet;

a packet transfer apparatus for transmitting/receiving the packet;

relay means for relaying the packet; and

a network serving as a backbone for transferring a superpacket having a length n times (n

is an integer of not less than 2) larger than a fixed-length cell, said superpacket serving as a

switching unit of said relay means,

wherein said packet transfer apparatus converts the packet into the superpacket and visa

versa, and further transfers the packet transmitted from a transmission-source access network to a

destination access network in a form of the superpacket through said relay means in said

network, and

wherein when the packet cannot fit the superpacket, the forming means places a portion

of the packet into the superpacket and another portion of the packet into another superpacket, and

wherein, when the superpacket is occupied with a single packet or a portion of the single

packet, the forming means sets a single packet occupation field to ON.

19. (Previously Presented) A system according to claim 18, wherein

said packet transfer apparatus and said relay means are assigned unique network

addresses defined only in said network, and

said network addresses of packet transfer apparatuses are stored in a header of the

superpacket as a transmission-source address and a destination address.

20. (Original) A system according to claim 19, wherein for superpackets having the

same destination packet transfer apparatus, different network addresses are assigned to

destination addresses in headers of the superpackets in accordance with a type of destination

access network connected to said destination packet transfer apparatus.

21. (Previously Presented) A system according to claim 19, wherein said relay means

comprises:

a route search table which stores a number of entries, said number of entries at least

corresponding to a number of said packet transfer apparatuses and relay means, each of said

entries connects a destination address in a header of the superpacket to a relay destination of the

superpacket, and

route search means for searching the route search table on the basis of the destination

address in the header of the superpacket to find the relay destination of the superpacket.

22. (Previously Presented) A system according to claim 18, wherein for same network

flow, said network flow comprises traffic through said relay means in said network, said traffic is

transmitted from said packet transfer apparatus connected to said transmission-source access

network, to said packet transfer apparatus connected to said destination access network,

superpackets corresponding to the same network flow have the same header.

23. (Currently Amended) The method according to claim 1, wherein said forming means

is configured to assemble the superpacket having a fixed length is assembled from a plurality of

packets and said plurality of packets are of variable lengths.

24. (Canceled).

25. (Currently Amended) The method according to claim 23, wherein the superpacket is

filled up so that no available region is left unless a time-out occurs forcing the transmission-

source apparatus to transmit the superpacket without being filled up with data stored in said at

least one packet, and wherein when the time-out occurs setting a padding information to ON to

indicate presence of an available, data-free region.

26. (New) The method according to claim 1, wherein the at least one packet is an IP

packet in a digital IP network, wherein the superpacket is transmitted in the digital IP network,

and wherein a header of the superpacket has same format as a header of the IP packet.